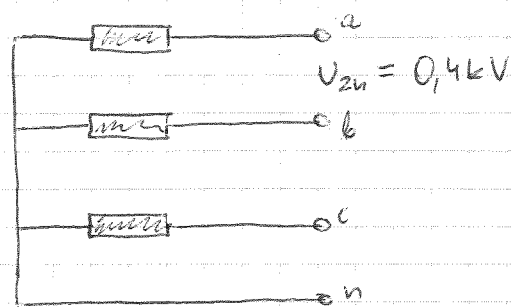
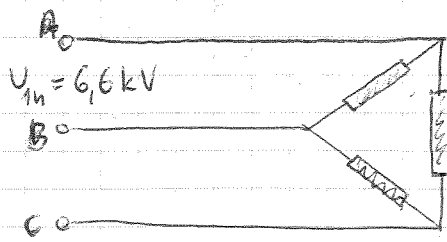


4.11

4.11/1

3-fas trafo $S_n = 125 \text{ kVA}$; $6,6/0,4 \text{ kV}$ $\Delta/Y-0$ 

Ksl. prov:

från 6,6 kV sidan

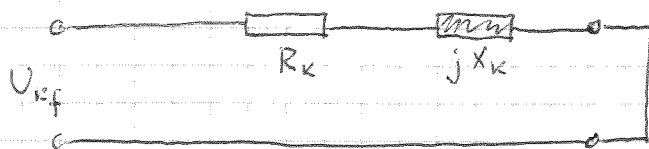
$$I_{1n} = \frac{S_n}{\sqrt{3} U_{1n}} = \frac{125 \cdot 10^3}{\sqrt{3} \cdot 6,6 \cdot 10^3} = 10,93 \text{ A}$$

$$I_k = I_{1n}$$

$$U_{kf} = I_k \cdot Z_k \Rightarrow Z_k = \frac{U_{kf}}{I_k} = \frac{310}{\sqrt{3} \cdot 10,93} = 16,37 \, \Omega / \text{fas}$$

$$\cos \varphi_k = \frac{P_k}{\sqrt{3} U_k I_k} = \frac{1330}{\sqrt{3} \cdot 310 \cdot 10,93} = 0,23 ; \sin \varphi_k = 0,97$$

$$\underline{Z}_k = Z_k (\cos \varphi_k + j \sin \varphi_k) = 16,37 (0,23 + j 0,97) = (3,77 + j 15,88) \, \Omega / \text{fas}$$



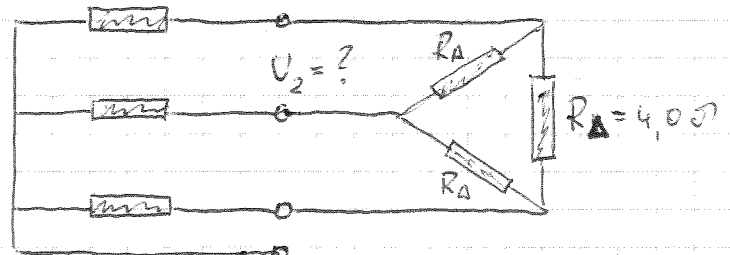
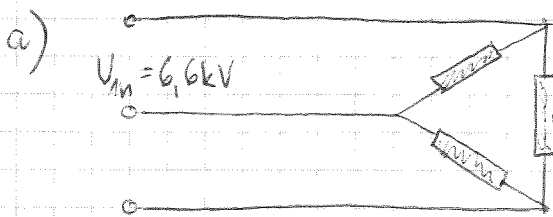
Ekv. Y-fas

vid ksl.

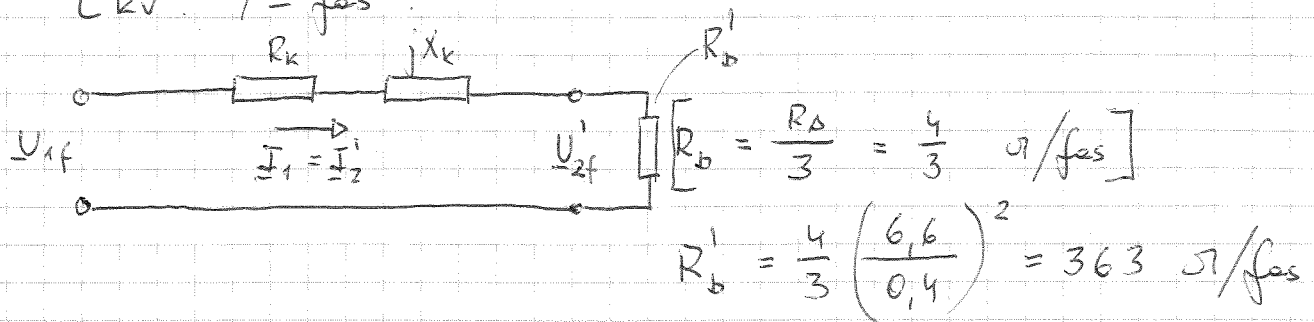
alt.:

$$P_k = 3 R_k I_k^2 \Rightarrow R_k$$

$$Q_k = P_k \tan \varphi_k \Rightarrow X_k = \frac{Q_k}{3 I_k^2} \quad \left(\text{alt } Q_k = \sqrt{S_k^2 - P_k^2} \right)$$



Ekv. Y-fas:



$$I_2' = \frac{U_{1f}}{Z_{tot}} = \frac{6600/\sqrt{3} \angle 0^\circ}{3,77 + j15,88 + 363} = \frac{6600/\sqrt{3} \angle 0^\circ}{367 \angle 2,48^\circ} = 10,38 \angle -2,48^\circ \text{ A} \quad |I_2'| = 10,38 \text{ A}$$

$$I_2 = I_2' \frac{U_{1n}}{U_{2n}} = 10,38 \frac{6,6}{0,4} = 171,3 \text{ A}$$

$$U_{2f} = R_b \cdot I_2 = \frac{4}{3} \cdot 171,3 = 228,4 \text{ V}$$

$$U_2 = \sqrt{3} \cdot U_{2f} = 395,6 \text{ V}$$

b) $I_1 = I_2'$ om I_0 försummas

$$I_\Delta = \frac{I_1}{\sqrt{3}} = 5,99 \text{ A}$$

extra Räkna fram z_k ; r_k ; x_k

$$Z_{bas} = \frac{U_n^2}{S_n} = \frac{6,6^2}{125} = 348,5 \Omega$$

$$z_k = \frac{16,37}{348,5} = 0,047 \hat{=} 4,7\%$$

$$r_k = \frac{3,77}{348,5} = 0,011 \hat{=} 1,1\%$$

$$x_k = \sqrt{z_k^2 - r_k^2} = \sqrt{4,7^2 - 1,1^2} = 4,57\%$$

4.16/1

$$S_n = 125 \text{ kVA} ; 6,6/0,4 \text{ kV} ; \Delta/Y$$

$$z_k = 4,7 \% ; r_k = 1,1 \%$$

$$z_k = \frac{Z_k}{Z_{bas}} ; r_k = \frac{R_k}{Z_{bas}} ; X_k = \sqrt{Z_k^2 - R_k^2}$$

Räkna på 0,4 kV sidan:

$$Z_{bas} = \frac{U_{n2}^2}{S_n} = \frac{400^2}{125 \cdot 10^3} = 1,28 \Omega/\text{fas}$$

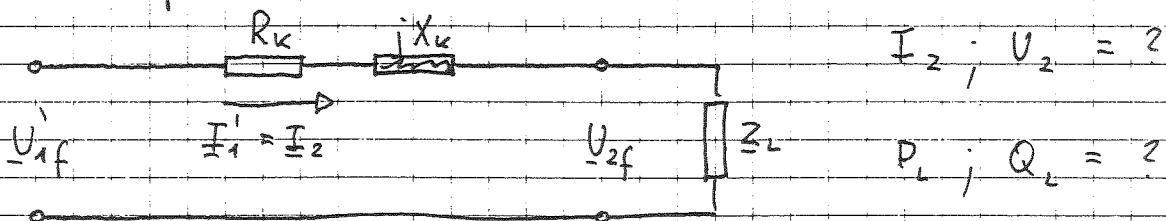
$$Z_k = 0,047 \cdot 1,28 = 60,2 \cdot 10^{-3} \Omega/\text{fas}$$

$$R_k = 0,011 \cdot 1,28 = 14,1 \cdot 10^{-3} \Omega/\text{fas}$$

$$X_k = 58,53 \cdot 10^{-3} \Omega/\text{fas}$$

a) Y-kopplad last - $Z_L = (0,6 + j1,0) \Omega/\text{fas} = 1,17 / 59,04^\circ \Omega/\text{fas}$

Ekv. Y-fas:



$$U'_{1f} = \frac{400}{\sqrt{3}} \text{ V} ; U'_{1f} = Z_{tot} I_2$$

$$\begin{aligned} Z_{tot} &= Z_k + Z_L = 14,1 \cdot 10^{-3} + j58,53 \cdot 10^{-3} + 0,6 + j1,0 = 0,614 + j1,059 = \\ &= 1,22 / 59,9^\circ \Omega/\text{fas} \end{aligned}$$

$$I_2 = \frac{400 / 0^\circ}{\sqrt{3} \cdot 1,22 / 59,9^\circ} = 189,3 / -59,9^\circ \text{ A} \quad \underline{\underline{I_2 = 189,3 \text{ A}}}$$

$$U_{2f} = Z_L I_2 = 1,17 / 59,04^\circ \cdot 189,3 / -59,9^\circ = 221,5 / -0,86^\circ \text{ V}$$

$$\underline{\underline{U_2 = \sqrt{3} U_{2f} = \sqrt{3} \cdot 221,5 = 383,65 \text{ V}}}$$

$$\underline{\underline{P_L = \sqrt{3} U_2 I_2 \cos \varphi_L = \sqrt{3} \cdot 383,65 \cdot 189,3 \cdot \cos 59,04 = 64,7 \text{ kW}}}$$

$$\underline{\underline{Q_L = \sqrt{3} U_2 I_2 \sin \varphi_L = \sqrt{3} \cdot 383,65 \cdot 189,3 \cdot \sin 59,04 = 107,9 \text{ kVAR}}}$$

b) ej då $I_2 > I_{n2} (180,4 \text{ A})$ transformatorn är överbelastad
 eller $S_2 > S_n$

$$\underline{\underline{c) \quad P_{cu} = 3 R_k I_2^2 = 3 \cdot 14,1 \cdot 10^{-3} \cdot 189,3^2 = 1,52 \text{ kW}}}$$

$$d) \quad I_1 = I_2 \frac{U_{n2}}{U_{n1}} = 189,3 \cdot \frac{0,4}{6,6} = 11,47 \text{ A}$$

$$\underline{\underline{I_\Delta = \frac{I_1}{\sqrt{3}} = 6,6 \text{ A}}}$$